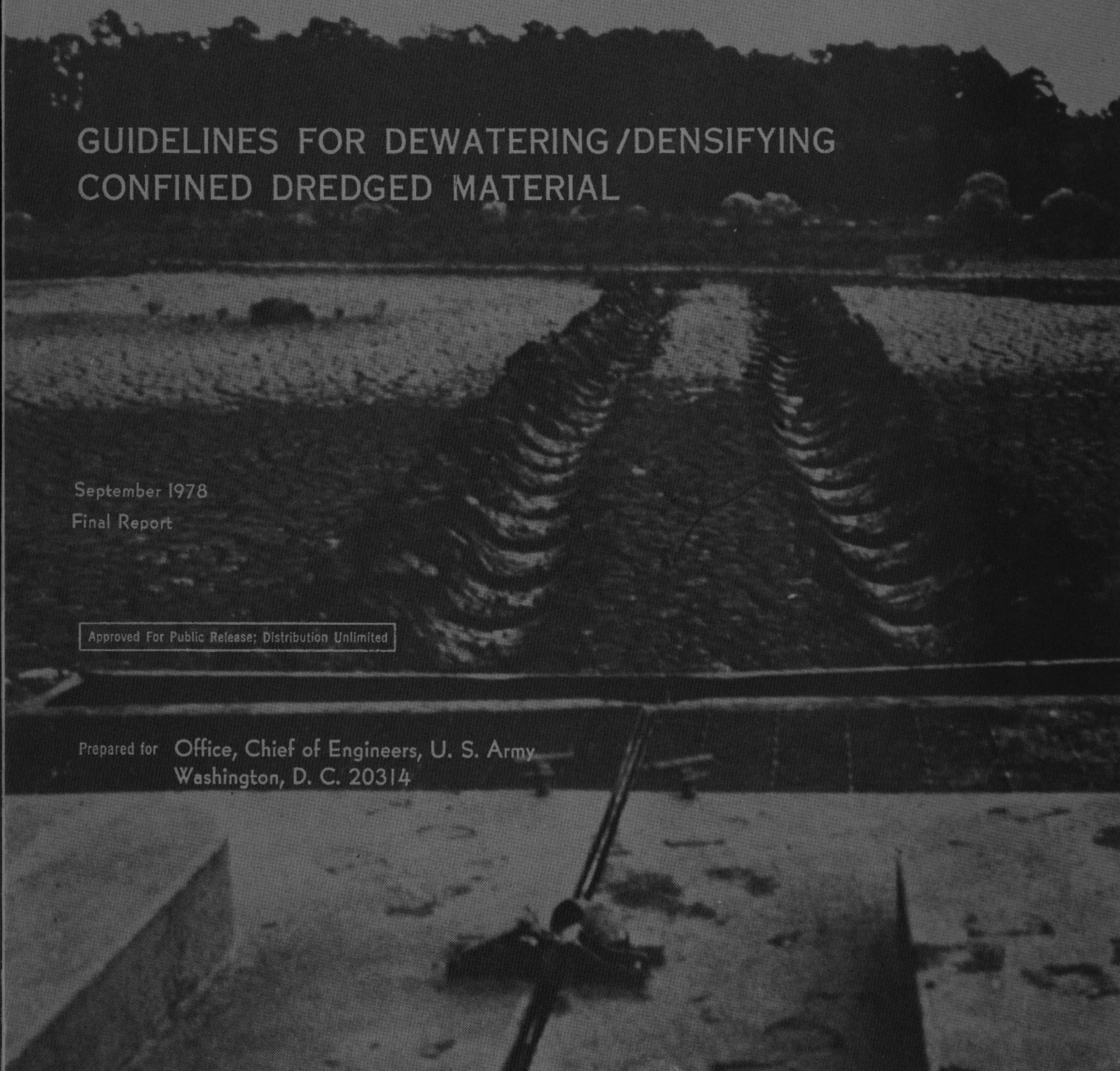
SYNTHESIS OF RESEARCH RESULTS

DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT DS-78-11



GUIDELINES FOR DEWATERING/DENSIFYING CONFINED DREDGED MATERIAL

September 1978

Final Report

Approved For Public Release; Distribution Unlimited

Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

THE DMRP SYNTHESIS REPORT SERIES

Technical Report No.	Title
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1. REPORT NUMBER Technical Report DS-78-11	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) GUIDELINES FOR DEWATERING/DENSIFYING CONFINED DREDGED MATERIAL		5. TYPE OF REPORT & PERIOD COVERED Final report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) T. Allan Haliburton		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Waterways Experiment Station Environmental Laboratory P. O. Box 631, Vicksburg, Miss. 39180		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS DMRP Work Unit No. 5A21
11. CONTROLLING OFFICE NAME AND ADDRESS Office, Chief of Engineers, U. S. Army Washington, D. C. 20314		12. REPORT DATE September 1978 13. NUMBER OF PAGES 130
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Densification (Soils)
Dewatering
Dredged material
Fine grained soils
Guidelines
Waste disposal sites

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Primary emphasis of Task 5A research was oriented toward dewatering fine-grained dredged material resulting from maintenance operations and placed in confined disposal areas. Based on results of research, as synthesized herein, it was determined that:

a. Use of progressive surface trenching concepts to remove disposal
(Continued)

20. ABSTRACT (Continued).

area ponded surface water and precipitation and enhance evaporative dewatering of fine-grained dredged material is the most cost-effective dewatering alternative. The net dewatering and dredged material reclamation produced from use of surface trenching concepts will depend on existing climatic conditions, channel sediment/dredged material engineering properties, and whether or not an aggressive and continuous surface trenching dewatering program is conducted. The most effective method of trench dewatering requires that a 1-ft or greater surface crust be developed in the disposal area as rapidly as possible to support conventional matted dragline equipment in further operations. Trenching with a vehicle developed for the Navy for travel in a riverine environment, the Riverine Utility Craft, was found to be the optimum method for obtaining this necessary crust thickness with minimum time and cost.

b. When existing constraints make it impossible to implement a surface trenching dewatering program, a surface trenching program alone will not produce dewatering at necessary rates, or it is desired to obtain maximum possible dewatering effects, various concepts of either gravity- or vacuum-assisted underdrainage may be applied. Effective underdrainage systems must be installed prior to disposal, either in or on the original disposal area foundation or in the surface trenching network developed during dewatering of a previously placed lift. Underdrainage dewatering may be cost-effective when pervious disposal area foundations are present or a nearby supply of suitable pervious material is available from previous dredging and disposal operations.

c. Implementation of any program of fine-grained dredged material dewatering and densification will be conducted most effectively as part of an overall confined disposal area management plan. Operation and management concepts are presented which, if implemented before, during, and/or after disposal, should result in enhanced dredged material dewatering. The concepts include thin lift placement; site clearing, grubbing, and leveling prior to disposal; optimized use of coarse-grained material available from dredging; subdivision of large disposal sites into smaller subareas and site operation on a series or parallel subarea basis; movement of dredged material inflow points during the disposal operation; and improvement of site access during construction.

The main technical unknown in application of concepts synthesized in the report is the exact rate at which dewatering will occur. State-of-the-art prediction methods given and referenced in the report are satisfactory for feasibility determinations, and, in many instances, use in final design.

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SUMMARY

Primary emphasis of Task 5A research was oriented toward dewatering fine-grained dredged material resulting from maintenance operations and placed in confined disposal areas. Based on results of research, as synthesized herein, it was determined that:

a. Use of progressive surface trenching concepts to remove disposal area ponded surface water and precipitation and enhance evaporative dewatering of fine-grained dredged material is the most cost-effective dewatering alternative. The net dewatering and dredged material reclamation produced from use of surface trenching concepts will depend on existing climatic conditions, channel sediment/dredged material engineering properties, and whether or not an aggressive and continuous surface trenching dewatering program is conducted. The most effective method of trench dewatering requires that a 1-ft or greater surface crust be developed in the disposal area as rapidly as possible to support conventional matted dragline equipment in further operations. Trenching with a vehicle developed for the Navy for travel in a riverine environment, the Riverine Utility Craft, was found to be the optimum method for obtaining this necessary crust thickness with minimum time and cost.

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The main technical unknown in application of concepts synthesized in the report is the exact rate at which dewatering will occur. State-of-the-art prediction methods given and referenced in the report are satisfactory for feasibility determinations, and, in many instances, use in final design.

PREFACE

This report synthesizes results of Dredged Material Research Program (DMRP) Disposal Operations Project (DOP) Task 5A, Dredged Material Densification. The DMRP was sponsored by the Office, Chief of Engineers, U. S. Army (DAEN-CWO-M), and was managed by the Environmental Laboratory (EL), U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss.

Research synthesized in this report was developed in 20 DMRP work units conducted by private research organizations; universities; elements of EL, the Mobility and Environmental Systems Laboratory, and the Soils and Pavements Laboratory (S&PL), WES; and elements of the U. S. Army Engineer District, Mobile. Research conducted under Task 5A was planned and managed by Dr. T. Allan Haliburton, DMRP Geotechnical Engineering Consultant. In addition to those of personnel involved in the 20 work units, special contributions to the research were made by Mr. J. Patrick Langan, Assistant Chief, Project Operations Branch, Mobile District; Mr. I. Braxton Kyzer, Chief, Navigation and Survey Branch, U. S. Army Engineer District, Charleston; Mr. Robert J. Kaufman, Assistant Chief, Engineering Division, U. S. Army Engineer Division, Lower Mississippi Valley; Mr. Walter C. Sherman, Research Civil Engineer, Soil Mechanics Division, S&PL, WES; Dr. William Patrick, Professor of Marine Sciences, Louisiana State University; Dr. Robert L. Lytton, Professor of Civil Engineering, Texas A&M University; and Dr. Kirk W. Brown, Associate Professor of Soil and Crop Sciences, Texas A&M University. The report was written by Dr. Haliburton under the general supervision of Mr. Charles C. Calhoun, Jr., DOP Manager; Dr. Roger T. Saucier, Special Assistant for Dredged Material Research; and Dr. John Harrison, Chief, EL.

This report is also being published as Engineer Manual 1110-2-5007.

Directors of WES during this period were COL G. H. Hilt, CE, and COL John L. Cannon, CE. Technical Director was Mr. F. R. Brown.

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CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
inches	2.54	centimetres
feet	0.3048	metres
yards	0.9144	metres
acres	4046.856	square metres
cubic yards	0.7645549	cubic metres
inches per year	2.54	centimetres per year
feet per hour	0.3048	metres per hour
miles (U. S. statute) per hour	1.609344	kilometres per hour
cubic yards per acre	0.0001889	cubic metres per square metre
pounds (mass)	0.45359237	kilograms
pounds (force)	4.448222	newtons
pounds (force) per square inch	6.894757	kilopascals
pounds (force) per square foot	0.04788026	kilopascals
gallons (U. S. liquid)	3.785412	cubic decimetres
degrees (angle)	0.01745329	radians